United States Patent

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[54] **TAP CUTTER**
3 Claims, 4 Drawing Figs.

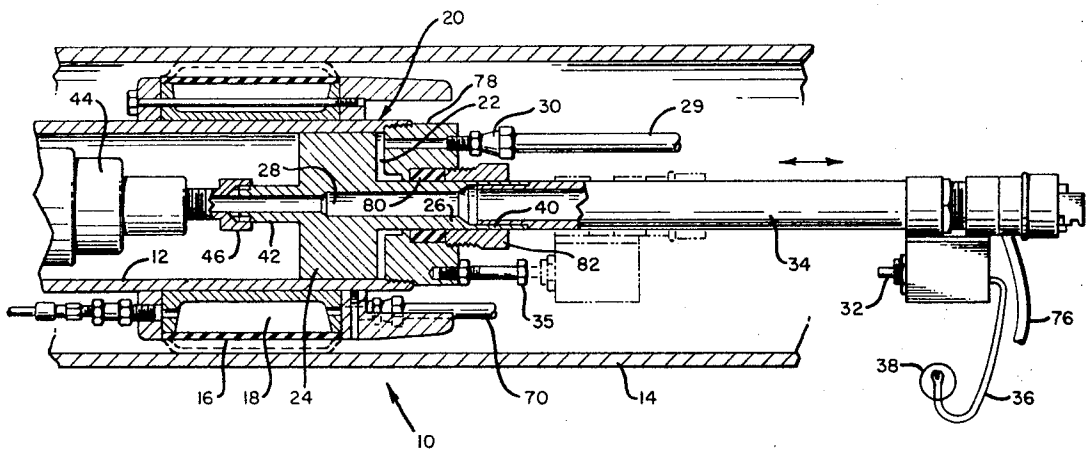
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[51] **Int. Cl.** **B24b 19/00**
[50] **Field of Search** ..... 15/104.16, 104.06; 51/241, 241 (S), 241.1, 332; 166/55.7, 55.8, (Inquired)

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ABSTRACT: A tap cutter comprising a frame or housing with inflatable sleeves around the housing which are expanded by pneumatic pressure to lock it in place frictionally in a selected position within a sewer, drainage line, or the like, a rotating cutter driven by a pneumatic motor and a piston for moving the cutter axially of the pipe through a predetermined stroke. The expansible locking means, the pneumatic motor and the piston are connected by ducts from a source of pressure fluid. A signal device may be provided to indicate when the stroke of the piston is completed.



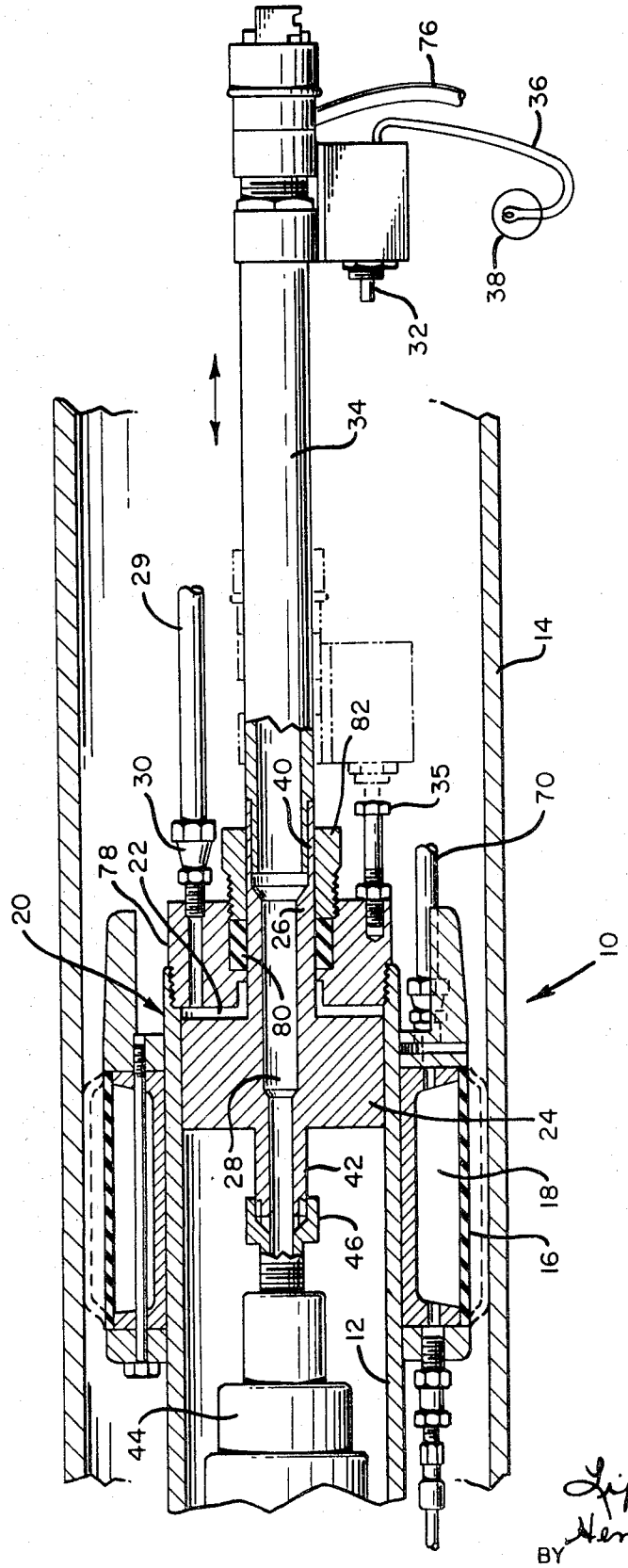


FIG-1A

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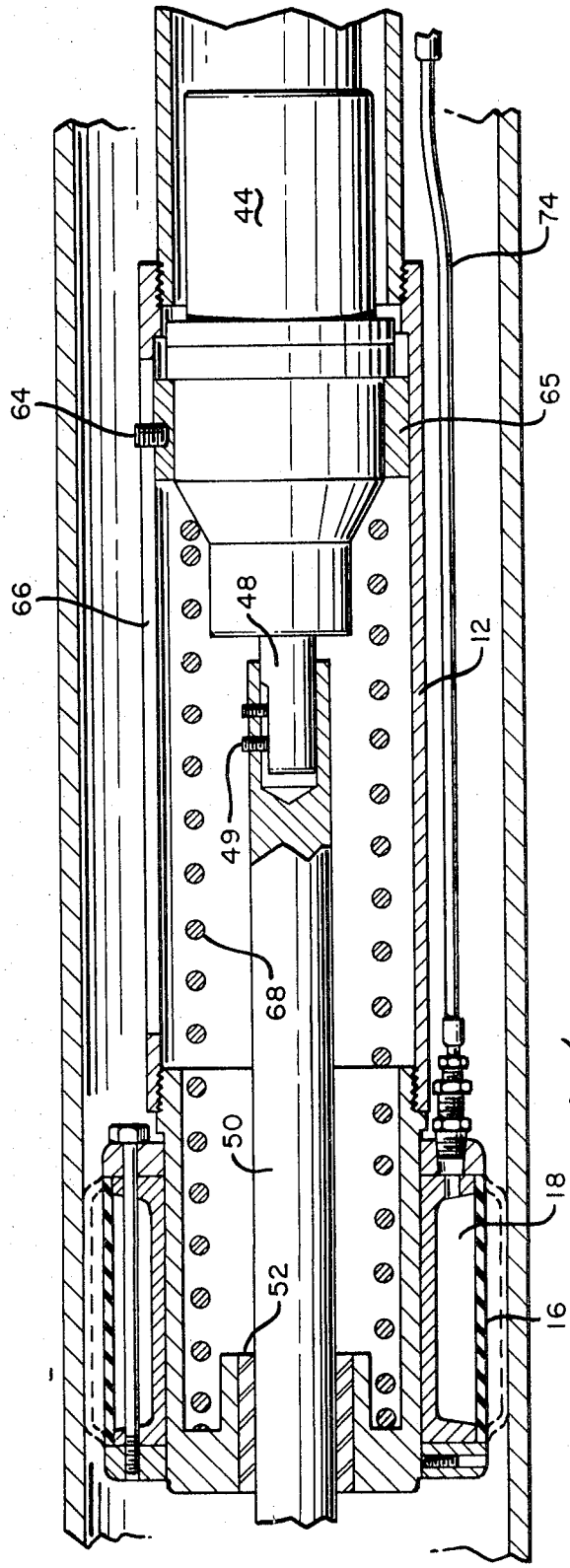


FIG-1B

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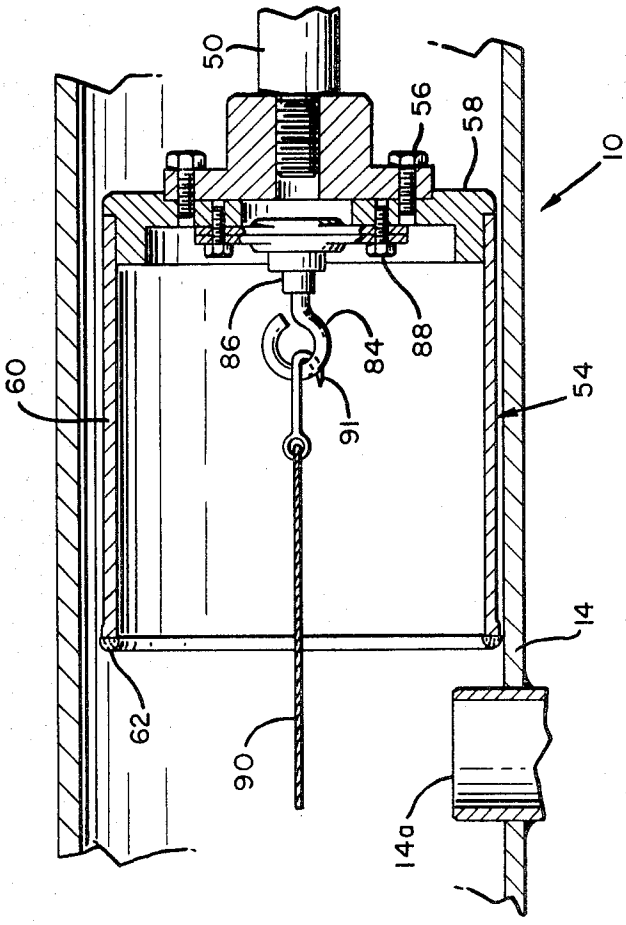


FIG-1C

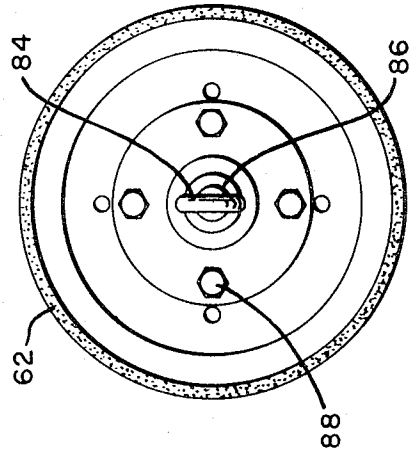


FIG-2

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TAP CUTTER

This invention relates to a tap cutter and, more particularly, to a tap cutter which may be secured in a predetermined position within a sewer line or other fluid conduit with a cutting device that is rotated and moves along the conduit through a predetermined stroke.

Conventionally, sewer mains are placed along streets and highways below the surfaces thereof with access to the sewer mains being gained by means of vertical conduits referred to as "manholes." Such sewer mains are generally of 6- or 8-inch diameter with manholes spaced at regular intervals of, say 400 feet apart.

According to present building codes, when a sewer line from a residence or other building is tapped into the sewer main the connection must be made according to certain prescribed standards with no portion of the tap line extending into the sewer main. However, prior to the adoption of such codes just a few years ago, plumbing subcontractors were interested primarily in making such tap connections by whichever means or method was most expeditious. Conventionally, the subcontractor merely broke an opening into the sewer main (which was commonly of ceramic material); he inserted the tap line through the opening so that it protruded into the main; and then he sealed any space around the opening with cement or other material to seal it off. Such tap connections were satisfactory for most purposes, but the protruding portions of the pipeline constituted a trap for leaves, roots, and other debris which could build up to clog or at least seriously impair the flow capacity of the sewer main.

It is therefore, an object of this invention to provide a device which will cut away the protruding portions of tap lines extending into sewer mains.

It is a further object of this invention to provide a device for cutting impedimenta from a sewer main, which device is short enough to be inserted into the line through a manhole.

It is a further object of this invention to provide a device for cutting impedimenta from a sewer main, which device may be locked in place in a selected position in the main while a cutting device is rotated and moved along the main through a predetermined stroke.

In carrying out this device, there is provided a frame or housing in which is carried a pneumatically driven motor for driving a rotating cutting device. The frame or housing is moved along the sewer main until an impediment is encountered and is there locked in place by expansible sleeves which are carried on the housing and expanded into frictional engagement with the inner surface of the sewer main. Then, after the cutting device is rotated, it is moved relative to the housing and along the main by means of a piston which pushes the motor within the housing. A switch device may operate a signal light when the stroke of the piston is completed. The expansible sleeve locking devices, the pneumatic motor and the piston may all be driven from a single source of pressure fluid.

Other objects and advantages of this invention will become apparent from the description following, when read in conjunction with the accompanying drawings wherein:

FIG. 1A is a view partially in vertical section showing one end of a device embodying features of this invention;

FIG. 1B is a section view of the housing with rotary motor embodying other features of this invention;

FIG. 1C is a vertical sectional view showing the cutting end of the device embodied in this invention; and

FIG. 2 is an end view of the cutting portion.

Referring now more particularly to FIG. 1A, the tap cutter **10** of this invention comprises a frame of housing **12** which may be anchored with a sewer main **14** by means of expansible sleeves **16** (FIGS. 1A and IB) which may be expanded into frictional engagement with the inner surface of the sewer main. The expansile sleeves **16** form the cylindrical outer walls of annular fluid chambers **18** which may be welded or otherwise secured around the housing **12**. When the sleeves are expanded as shown in phantom they grip the inner surface of the sewer main **14** to anchor the tap cutter **10**.

Once the housing **12** is anchored the cutting tool hereinafter to be described is moved through the main by a linear drive assembly **20** which includes a pneumatic or other pressure fluid, a cylinder portion **22** in which is slidably carried a piston **24** from which there is extended a hollow piston rod **26** forming a central fluid passageway **28**. This piston is forced toward the left in FIG. 1A by introduction of a pressure fluid, such as compressed air through a suitable duct **29** and through the fitting **30**. A switch **32** carried on a tubular extension **34** of the piston rod **26** is preferably provided to engage an adjustable stop **35** on the housing **12**, as shown in phantom, to complete an electrical circuit **36** and energize a suitable signal device such as a lamp **38** to indicate when the stroke is complete. The piston rod extension **34** may be removed at **40** if the manhole (not shown) is of a small enough diameter to require it.

The passageway **28** through the extension **34**, the piston rod **26** and a forward extension **42** of the piston **24** supplied pressure fluid to a rotary pneumatic motor **44** which is secured to the forward extension **42** of the piston as by means of a threaded coupling **46**.

The output shaft **48** (FIG. 1B) of the motor **44** is keyed or otherwise secured as by means of setscrews **49** to a drive shaft **50** rotatably carried in a bushing **52** at the output end of the housing **12**, and the end of the drive shaft is in turn threaded or otherwise secured to an annular cutting bit **54** (FIG. 1C). The cutting bit may be secured to the output shaft by threading a reduced end thereof into a boss **56** which is secured by capscrews **56** or the like to the bit end wall **58**. Welded or otherwise secured around the bit end wall **58** is a sleeve having an annular cutting edge **62** which preferably is a diamond cutter.

Thus, in operation, the rotary motor **44** is driven by pressure fluid entering along the hollow piston rod passageway **28**, and it is moved along the housing by means of the pressure piston **24** with the motor being guided linearly by any suitable means, such as an extending screw **64** carried on a slide bushing **65** clamped to the motor **44** and slidable along a longitudinal slot **66** cut in the housing **12**. When the pressure is relieved behind the piston, the entire assembly is returned to its initial position by means of a compression spring **68** extending between the motor housing and the end of the main housing.

It will be apparent that the tap cutter may be operated entirely from a single source of pressure fluid. That is, suitable duct means **70** are connected to the first expansible sleeve-locking chamber by fittings **72** and the sleeves are expanded simultaneously by a connecting duct **74**. Similarly, the duct **27** introduces pressure fluid behind the piston **26** and a third duct **76** is provided to deliver pressure fluid to the passageway **28** through the hollow rods **26**, **34** and **42** to provide the pressure fluid (not shown) which may be operated from the street surface above the manhole. The piston rod **26** extends slidably through the end wall **78** of the cylinder which is provided with suitable packing **80** and a compression screw **82** to seal around the piston rod and insure that it is fluidtight.

As shown in FIG. 1C and **2**, a hook device **84** is carried on a swivel member **86** which, in turn, is secured by capscrews **88** or the like to the end wall **58** of the cylindrical cutting member **60** so that the entire housing may be moved along the sewer main by pulling on a cable **90**.

In operation, the tool is operated by a two man crew working from adjacent manholes which are spaced regularly along the sewer main approximately 400 feet apart. The cable **90** is passed along the sewer line from one manhole to the next by any suitable means, such as "parachuting" wherein a small parachutelike cloth is secured to the end of the cable so that the flowing stream pulls the cable downstream from a compressor or the like. Of course, other methods may be used to move the cable end to the next manhole, such as floating rods, or any suitable power means. In any event, when the cable is received at the next manhole, the second member of the crew lowers the tap cutter **10** down the manhole and into the sewer main **14**. In some instances it is necessary to remove the extending piston rod **34** as by breaking the connection at **40**, but

otherwise, the entire housing is of such length to fit through any standard manhole and be placed within the sewer main. Then, the second member of the crew merely attaches the hook **91** on the end of the cable to the hook **84** on the swivel mounting **86** in the cutting member **60** and the entire housing **12** is pulled by the first crew member along the sewer main until an obstruction is encountered. At this point, the source of pressure fluid (not shown) is started and pressure fluid is first introduced into the line **70** to inflate the expansible locking means **16** and firmly position the housing in place within the main. Then the fluid is introduced through the line **76** and into the hollow passageway **28** to commence rotation of the motor **44** and, hence, the cutting tool **60**. With the cutting tool rotated, the pressure fluid is introduced into the line **29** and into the cylinder **22** to cause the piston **24** to commence movement forwardly, with the motor being guided along the slot **66** against the force of the spring **68**. The length of the stroke should be more than adequate to complete severance of the protruding tap line **14***a* and is preferably long enough to insure cutting away any obstructive material which may be lodged behind it. When the stroke of the piston is completed, the switch **32** carried on the piston rod extension **34** engages the stop member **35** to complete the electrical system **36** and energize the signal light **38** whereby the operator is advised that the operation is completed.

At this time the pressure is relieved to cease operation of the motor and permit the piston to be retracted by the compression spring **68**. Then, when pressure is relieved from the expansible locking sleeves **16** the device **10** is pulled forwardly through the main until another protuberance **14***a* is encountered and the operation is repeated.

While this invention has been described in conjunction with preferred embodiments thereof, it is obvious that modifications and changes therein may be made by those skilled in the art without departing from the spirit and scope of this invention as defined by the claims appended hereto.

I claim:

1. A device for removing obstacles such as tap lines extending into a main conduit, said device comprising:

a frame movable axially within a conduit,

means for locking the frame in selected position within such conduit, said means comprising a chamber for receiving fluid pressure, said chamber including an outer expansible sleeve member responsive to fluid pressure introduced into the chamber to expand radially outwardly, to contact the inner surface of such conduit and to lock the frame in place,

a cutting member rotatable on said frame and adapted to cut obstructions protruding radially inwardly from the inner surface of such conduit,

means for rotating said cutting member,

means for introducing fluid under pressure into said chamber, and

means for moving said cutting member linearly on said frame and axially of said conduit.

2. The device defined by claim **1** wherein,

said rotating means comprises a rotary pressure fluid-operated motor, and

said linear moving means comprises:

a cylinder on said frame,

a piston slidably carried in said cylinder and connected to said rotary motor and including,

duct means connecting said rotary motor and said piston to a source of pressure fluid.

3. The device defined by claim **1** wherein said locking means comprises:

A fluidtight chamber on said frame,

a flexible sleeve forming the outer wall of said chamber,

said sleeve being expansible into firm frictional engagement with the interior wall of a fluid conduit, and including

duct means connecting said chamber to a source of pressure fluid,

said rotating means comprises:

a rotary pressure fluid-operated motor, and

said linear moving means comprises:

a cylinder on said frame,

a piston slidably carried in said cylinder and connected to said rotary motor, and including:

duct means connecting said rotary motor and said piston to a source of pressure fluid.